

The opinion in support of the decision being entered today was not written for publication and is not binding precedent of the Board.

Paper No. 40

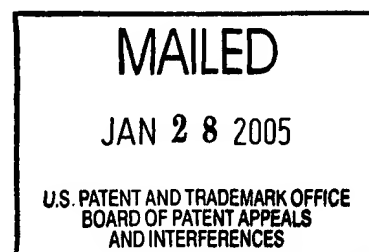
UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE BOARD OF PATENT APPEALS
AND INTERFERENCES

Ex parte JUNICHI SATO

Appeal No. 2004-1907
Application No. 09/161,520

HEARD: Jan. 12, 2005



Before PAK, OWENS, and DELMENDO, Administrative Patent Judges.

DELMENDO, Administrative Patent Judge.

DECISION ON APPEAL

This is a decision on an appeal under 35 U.S.C. § 134 (2004) from the examiner's final rejection of claims 12 through 14, 16 through 20, 22, and 24 through 27 (final Office action mailed Jan. 23, 2002, paper 22), which are all of the claims pending in the above-identified application.¹

¹ In reply to the final Office action, the appellant submitted an amendment pursuant to 37 CFR § 1.116 (2003) (effective Feb. 5, 2001) on Jul. 23, 2002 (paper 25), proposing changes to claims 12 and 16. The examiner indicated

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The subject matter on appeal relates to a chemical-mechanical polishing process for planarizing one or more thin films formed on a substrate. Further details of this appealed subject matter are recited in representative claims 12 through 14, 16, 19, and 22 reproduced below:

12. A chemical-mechanical polishing process for planarizing one or more thin films formed on a substrate, wherein the chemical-mechanical polishing is performed using an abrasive particles basic slurry, all of said abrasive particles consisting of boehmite.

13. A chemical-mechanical polishing process according to claim 12, wherein the particles of boehmite are formed by dipping of particles of Al in a hot water.

14. A chemical-mechanical polishing process according to claim 13, wherein said hot water is added with sodium aluminate.

16. A chemical-mechanical polishing process for planarizing one or more films formed on a substrate, wherein said thin films are subjected to chemical-mechanical polishing using an abrasive particles slurry, all of said abrasive particles consisting essentially of boehmite, and the residual slurry and contamination are removed by spin cleaning.

in the examiner's answer mailed Sep. 26, 2002 (paper 28, p. 2) that the amendment has been entered for purposes of this appeal. In addition, the appellant has submitted exhibits in the form of printouts of certain web pages attached to the reply brief filed on Nov. 26, 2002 (paper 30). According to the examiner, these exhibits have been entered. (Supplemental examiner's answer mailed Sep. 15, 2003, paper 36, p. 1.)

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19. A chemical-mechanical polishing process according to claim 16, wherein the abrasive particles of boehmite are formed by dipping of particles of Al in a hot water.

22. A polishing process which comprises the steps of:

forming abrasive boehmite particles by dipping particles of aluminum in heated water with sodium aluminate added thereto;

creating a slurry containing said abrasive boehmite particles; and

planarizing at least one film formed on a substrate by employing a chemical-mechanical polishing process using said slurry.

The examiner relies on the following prior art references as evidence of unpatentability:

| | | |
|-----------------------------------|--|---------------|
| Cote et al. (Cote) | 4,956,313 | Sep. 11, 1990 |
| Winebarger et al. (Winebarger) | 5,478,436 | Dec. 26, 1995 |
| Wang et al. (Wang) | 5,693,239 (filing date Oct. 10, 1995) | Dec. 02, 1997 |
| Krusell et al. (Krusell) | 5,723,019 (filing date Jul. 15, 1994) | Mar. 03, 1998 |

Karl Wefers & Chanakya Misra, Oxides and Hydroxides of Aluminum, ALCOA Technical Paper No. 19, Rev. 1-63 (1987) (Wefers).

The claims on appeal stand rejected as follows:

I. claims 14, 20, 22, and 24 through 27 under the first paragraph of 35 U.S.C. § 112 "as containing subject matter which was not described in the specification in

such a way as to enable one skilled in the art to which it pertains, or with which it is most nearly connected, to make and/or use the invention" (answer at 6-7);

II. claims 12 through 14 under 35 U.S.C. § 103(a) as unpatentable over the combined teachings of Cote and Wang (id. at 3-4);

III. claim 13 under 35 U.S.C. § 103(a) as unpatentable over the combined teachings of Cote, Wang, and Wefers (id. at 5);

IV. claims 16 through 20 under 35 U.S.C. § 103(a) as unpatentable over the combined teachings of Wang, Krusell, and Winebarger (id. at 5-6); and

V. claim 19 under 35 U.S.C. § 103(a) as unpatentable over the combined teachings of Wang, Krusell, Winebarger, and Wefers (id. at 6).²

² The examiner states that "[t]he rejection [sic, rejections] of claims 12-14 based on Yamada [United States Patent 5,366,542 to Yamada et al. (Yamada) issued on Nov. 22, 1994] has [sic, have] been removed." (Answer at 3.) We further note that the rejections of claims 12 through 14 under 35 U.S.C. § 102(a) or 102(e) as anticipated by or, in the alternative, under 35 U.S.C. § 103(a) as obvious over Yamada, as well as the rejection of claim 13 under 35 U.S.C. § 103(a) as unpatentable over Yamada in view of Wefers, all as set forth in the final Office action, have not been repeated in the answer.

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We reverse the rejection under: 35 U.S.C. § 112, ¶1, of appealed claims 14, 20, 22, and 24 through 27; and 35 U.S.C. § 103(a) of appealed claim 14 as unpatentable over the combined teachings of Cote and Wang. We affirm, however, all other rejections.³

I. 35 U.S.C. § 112, ¶1: Claims 14, 20, 22, & 24-27

The examiner's position is that "[t]he claimed recitation of adding sodium aluminate during the manufacture of boehmite is not properly enabled by the specification as originally filed." (Answer at 6.) According to the examiner, "[a]pplicant has failed to disclose how much sodium aluminate is to be added, under what conditions it is to be added, or why it is to be added." (Id. at 7.) We cannot agree.

Accordingly, we presume that these rejections have been withdrawn. Ex parte Emm, 118 USPQ 180, 181 (Bd. App. 1957).

³ The appellant submits that the appealed claims should be grouped separately as follows: (i) claims 12 and 13; (ii) 14; (iii) claims 16-19; (iii) claim 20; and (iv) 22 and 24-27. (Appeal brief at 7; reply brief at 3.) We note, however, that the appellant does not present any argument in support of the separate patentability of any claim with respect to the 35 U.S.C. § 103(a) rejection of appealed claims 16-20 over Wang, Krusell, and Winebarger. Accordingly, with respect to this ground of rejection, claims 16-20 stand or fall together. For each of the other grounds of rejection, we will consider the claims separately to the extent that the appellant has complied with 37 CFR § 1.192(c)(7) (2003) (effective Apr. 21, 1995).

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Like any other rejection, the initial burden of establishing a prima facie case of unpatentability based on non-enablement under the first paragraph of 35 U.S.C. § 112 rests on the examiner. In re Oetiker, 977 F.2d 1443, 1445, 24 USPQ2d 1443, 1444 (Fed. Cir. 1992). A predecessor of our reviewing court has explained that it is only upon the advancement of acceptable reasoning inconsistent with enablement that the burden of proving enablement shifts to an applicant. In re Strahilevitz, 668 F.2d 1229, 1232, 212 USPQ 561, 563 (CCPA 1982).

"Although not explicitly stated in section 112, to be enabling, the specification of a patent must teach those skilled in the art how to make and use the full scope of the claimed invention without 'undue experimentation.'"⁴ In re Wright, 999 F.2d 1557, 1561, 27 USPQ2d 1510, 1513 (Fed. Cir. 1993). As long

⁴ The question of whether making and using the invention would have required "undue experimentation" depends on several underlying factual inquiries including: (1) the quantity of experimentation necessary; (2) the amount of direction or guidance presented; (3) the presence or absence of working examples; (4) the nature of the invention; (5) the state of the prior art; (6) the relative skill of those in the art; (7) the predictability or unpredictability of the art; and (8) the breadth of the claims. In re Wands, 858 F.2d 731, 735, 736-37, 8 USPQ2d 1400, 1402, 1404 (Fed. Cir. 1988).

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as "undue experimentation" is not involved, a specification would comply with the enablement requirement of the statute even if a reasonable amount of routine experimentation is necessary to practice the claimed invention. Enzo Biochem Inc. v. Calgene, 188 F.3d 1362, 1371, 52 USPQ2d 1129, 1135 (Fed. Cir. 1999). That is, even "a considerable amount of experimentation is permissible, if it is merely routine, or if the specification in question provides a reasonable amount of guidance with respect to the direction in which the experimentation should proceed..." Wands, 858 F.2d at 737, 8 USPQ2d at 1404.

In this case, the object of the appellant's claimed chemical-mechanical polishing process is adequately disclosed in the specification (pages 4-6). Furthermore, the specification states that, during the formation of boehmite by dipping aluminum particles in hot water at 80°C, "it is effective to add sodium aluminate to the hot water, as needed." (Id. at 13.) Contrary to the examiner's apparent belief, we find no basis to conclude that any undue experimentation would be involved in determining an optimum or workable range of amounts for the sodium aluminate to be added to the hot water.

For this reason, we cannot uphold the examiner's rejection on this ground.

II. 35 U.S.C. § 103(a): Claims 12-14 over Cote & Wang

Regarding claim 12, we are in complete agreement with the examiner's factual findings and legal conclusions. (Answer at 3-4.) Specifically, Cote discloses a planarization etch process in which a structure including tungsten 55 and borophosphosilicate (BPSG) 40 on p-type, oriented microcrystalline Si wafer is polished using an abrasive slurry consisting of Al_2O_3 particulates, deionized water, a base, and an oxidizing agent providing "W:BPSG etch rates sufficient to produce a planar surface." (Column 4, line 63 to column 5, line 39; Figures 1-4 and 7.)

Cote does not teach the use of an abrasive slurry in which all of the abrasive particles consist of boehmite as recited in appealed claim 12.

Wang teaches that it was known in the art to use a slurry of alumina (e.g., aluminum monohydroxides such as boehmite) in chemical-mechanical polishing processes. (Column 1, line 55 to column 2, line 10.) According to Wang, "unexpectedly high rate of metal removal from a work piece undergoing chemical-mechanical polishing" is achieved by using an aqueous slurry of 1 to 50% submicron alpha-alumina, the remainder of the solids being a second substantially less abrasive phase, preferably

boehmite. (Column 3, lines 19-36; column 4, lines 26-41.) Wang further discloses that "[t]he function of the alpha-alumina is to provide high removal rate and low rate selectivity relative to the bond layer" (column 3, lines 65-67), while the function of the substantially less abrasive phase "is believed to be the reduction of the polishing rate of the dielectric component of the device relative to pure alpha-alumina so that the metal/dielectric polishing selectivity is increased" (column 4, lines 7-16). As pointed out by the examiner (answer at 4), Wang teaches a slurry in which the alpha-aluminum content was 0% (i.e., the slurry consisted of the substantially less abrasive phase) exhibited some desirable chemical-mechanical polishing properties, including the highest W/SiO₂ or W/TiN selectivity. (Table 1.)

Given these teachings, we share the examiner's view that one of ordinary skill in the art would have found it prima facie obvious to use an aqueous slurry of abrasive particles consisting of boehmite in a chemical-mechanical polishing process, with the reasonable expectation of achieving high W/SiO₂ or W/TiN selectivity. While Wang is primarily concerned with effects different from those achieved by using a slurry of abrasive particles consisting of boehmite, it has long been held

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that all of the disclosures of a prior art reference, including non-preferred embodiments, must be considered for what they fairly teach one of ordinary skill in the art. Merck & Co. Inc. v. Biocraft Labs. Inc., 874 F.2d 804, 807, 10 USPQ2d 1843, 1846 (Fed. Cir. 1989); In re Fracalossi, 681 F.2d at 794 n.1, 215 USPQ at 570 n.1; In re Lamberti, 545 F.2d 747, 750, 192 USPQ 278, 280 (CCPA 1976); In re Boe, 355 F.2d 961, 965, 148 USPQ 507, 510 (CCPA 1966).

Because the appellant does not adequately rebut the examiner's prima facie case of obviousness against appealed claim 12 with persuasive argument or evidence, we uphold the examiner's rejection of appealed claims 12 and 13 on this ground.

As to separately argued claim 14, it is the examiner's position that "a product-by-process limitation does not exclude other products made by other processes, if the products themselves are prima facie not distinguishable from the claimed product by process." (Answer at 5.) We disagree. Appealed claim 14, which depends from claim 13, which in turn depends from claim 12, recites material steps for the claimed process.

For this reason, we cannot affirm this rejection as to appealed claim 14.

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III. 35 U.S.C. § 103(a): Claim 13 over Cote, Wang, & Wefers

The examiner relies on Wefers for its teaching that boehmite may be formed by treating aluminum with hot water. (Answer at 5; Wefers at 15.) From this evidence, the examiner holds that "it would have been prima facie obvious to use boehmite formed by this method in the process taught by Wang." (Answer at 5.) We agree.

The appellant is correct in arguing that Wefers does not teach a chemical-mechanical polishing process. (Appeal brief at 9.) Nevertheless, Wefers teaches that reacting aluminum with hot water is a simple, well known method of forming boehmite. Thus, it is our judgment that one of ordinary skill in the art would have found it obvious to use Wefers's boehmite production method in the process described in Wang in order to prepare the boehmite in a simple manner.

For this reason, we uphold the examiner's rejection on this ground.

IV. 35 U.S.C. § 103(a): Claims 16-20 over
Wang, Krusell, & Winebarger

Appealed claim 16 recites "all of said abrasive particles consisting essentially of boehmite, and the residual slurry and contamination are removed by spin cleaning."

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The appellant does not dispute the examiner's factual findings regarding Krusell and Winebarger. Nor does the appellant point out any error in the examiner's combination of Krusell and Winebarger with Wang. Rather, it is the appellant's main argument that Wang does not teach the use of slurries of abrasive particles consisting essentially of boehmite.

We find no merit in the appellant's position. As we discussed above, Wang provides the requisite motivation, suggestion, or teaching for one of ordinary skill in the art to use a slurry of abrasive particles consisting of boehmite to obtain the known advantages of such a slurry, as disclosed in Wang. Also, contrary to the appellant's belief, there is no evidence to indicate that the presence of 1% alpha-alumina in the slurry would materially affect the basic and novel characteristics of the appellant's claimed invention.⁵ Moreover, Wang teaches the function of the alpha-alumina. (Column 3, lines 65-67.) Its omission from Wang's slurry, thereby forming a less preferred but nonetheless still useful polishing slurry, with the attendant loss of its function would have been prima

⁵ PPG Industries Inc. v. Guardian Industries Corp., 156 F.3d 1351, 1354, 48 USPQ2d 1351, 1353-54 (Fed. Cir. 1998); In re Herz, 537 F.2d 549, 551-52, 190 USPQ 461, 463 (CCPA 1976).

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facie obvious to one of ordinary skill in the art. In re Kuhle,
526 F.2d 553, 555, 188 USPQ 7, 8-9 (CCPA 1975).

For this reason, we uphold this ground of rejection.

V. 35 U.S.C. § 103(a): Claim 19 over
Wang, Krusell, Winebarger & Wefers

The appellant chose not to argue this rejection separately.
Accordingly, we affirm for the same reasons set forth in IV
above.

Summary

In sum, we reverse the examiner's rejections under: 35
U.S.C. § 112, ¶1, of appealed claims 14, 20, 22, and 24 through
27; and 35 U.S.C. § 103(a) of appealed claim 14 as unpatentable
over the combined teachings of Cote and Wang. We affirm,
however, the examiner's rejections under 35 U.S.C. § 103(a) of:
appealed claims 12 and 13 as unpatentable over the combined
teachings of Cote and Wang; appealed claim 13 as unpatentable
over the combined teachings of Cote, Wang, and Wefers; appealed
claims 16 through 20 as unpatentable over the combined teachings
of Wang, Krusell, and Winebarger; and appealed claim 19 as
unpatentable over the combined teachings of Wang, Krusell,
Winebarger, and Wefers.

The decision of the examiner is therefore affirmed in part.

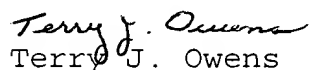
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No time period for taking any subsequent action in
connection with this appeal may be extended under 37 CFR
§ 1.136(a).

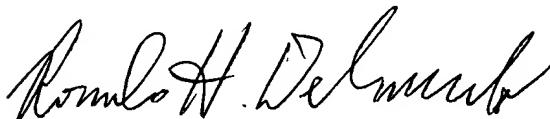
AFFIRMED IN PART



Chung K. Pak
Administrative Patent Judge



Terry J. Owens
Administrative Patent Judge



Romulo H. Delmendo
Administrative Patent Judge

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